

AMERICAN BEES OF THE GENUS CHELOSTOMA

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Chelostoma is a small, holarctic genus of slender, black, osmiine bees. In North America several species have been placed in this group but most of them have since been transferred to other genera, leaving only a small number of western species in *Chelostoma*. Among the species thus removed is *Prochelostoma philadelphi* (Robertson) from the eastern United States. This insect might well remain in *Chelostoma*, perhaps as a subgenus. It differs from typical *Chelostoma* in the shape of the third segment of the labial palpus, which tapers toward the base in *Prochelostoma* whereas it is parallel-sided or tapers slightly toward the apex in *Chelostoma*. The genitalia of *Prochelostoma* are not strikingly different from those of *Chelostoma*.

Chelostomopsis is quite distinct from *Chelostoma*, the male of the former having only six exposed tergites and having the process of the coxopodite of the genitalia broadened apically. The third segment of the labial palpus tapers basally and is joined to the second a little before its apex. In the allied genus *Formicapis* the third segment of its labial palpus also tapers basally. *Autochelostoma* does not belong to the group of genera near *Chelostoma* but is based upon a gynandromorphic specimen of *Alcidamea producta*.

The genus *Chelostoma* may be recognized by the following characters:

Slender, black; first segment of labial palpus a little over one-third to about one-fourth as long as second; third segment compressed, apparently rigidly joined to second, about parallel-sided or tapering slightly apically; maxillary palpi short, three- or four-segmented; thorax elongate, the metanotum and dorsal part of propodeum horizontal; prepectal carina absent; notaulices long linear; first tergite with shallow longitudinal basal sulcus, anterior face not bounded by carina; male with seven exposed tergites and six exposed sternites; coxopodite of male genitalia broad basally, produced to a long, very slender, process.

¹ To Mr. P. H. Timberlake of Riverside, California, I wish to express my appreciation for his helpful suggestions and for the opportunity to study his fine collection of Californian *Chelostoma*.

KEY TO THE AMERICAN SPECIES OF *Chelostoma*

MALES

1. Seventh tergite ending in four slender processes, median pair sometimes united for a part of their length.....*minutum*
- ... Seventh tergite ending in three processes.....2
2. Processes of seventh tergite short (figure 2); posterior face of propodeum above median pit smooth and polished; length 8 mm.*californicum*
- ... Processes of seventh tergite long (figure 1); posterior face of propodeum rather dull; length 6 mm. or less.....3
3. Maxillary palpus three-segmented; median tooth of seventh tergite directed more ventrally than are the lateral teeth.*bernardinum*
- ... Maxillary palpus four-segmented; median tooth of seventh tergite in same plane as lateral teeth.....*phaceliæ*

FEMALES

1. Posterior face of propodeum above median pit polished; length about 8 mm. (rarely 6½ mm.).....*californicum*
- ... Posterior face of propodeum rather dull; length less than 6 mm.2
2. Maxillary palpus four-segmented.....*phaceliæ*
- ... Maxillary palpus three-segmented.....3
3. Anterior margin of clypeus between tubercles minutely crenulate; facial line about equal to transfacial line.....*bernardinum*
- ... Anterior margin of clypeus between tubercles straight; facial line distinctly longer than transfacial line.....*minutum*

CHELOSTOMA CALIFORNICUM Cresson

- californicum* Cresson, 1878, Trans. Am. Ent. Soc., 7:108, ♂
 Schletterer, 1889, Zool. Jahrb. (Syst.), 4:649, ♂
 Titus, 1906, Proc. Ent. Soc. Wash., 7:161, ♀ ♂
- albicinctum* Provancher, 1895, Nat. Can., 22:190 (*Heriades*), ♀ ♂
- odontura* Cockerell, 1902, Bull. So. Calif. Acad. Sci., 1:139
 (*Heriades*), ♂
- dolichosoma* Cockerell, 1922, Ann. Mag. Nat. Hist., (9)10:456
 (*Robertsonella*). ♀, n. syn.

This is the largest and most conspicuously pubescent American species in the genus. Length 8 to 9 mm. (rarely only 6½ mm).

Male: Pubescence fairly abundant, whitish, forming apical bands on tergites; first segment of labial palpus about one-third as long as second; maxillary palpi short, three-segmented, first segment very short, second and third longer and subequal in

length; glossa about as long as facial line; body finely punctate; dorsum of propodeum very finely and closely roughened, dull; posterior face of propodeum above pit polished and impunctate, elsewhere shiny and coarsely punctate; abdomen a little more finely punctate than thorax; second sternite with median elevation, seventh tergite with median depression and three apical processes; parameres and process of coxopodites of genitalia bent downward apically.

Female: Similar to male; face broader; clypeus closely punctate, with a pair of variable, often inconspicuous, widely separated tubercles on anterior margin; edge between marginal tubercles of clypeus straight, but medially with a pair of pre-marginal tubercles; punctures of posterior face of propodeum finer than in male; hind metatarsus longer than remaining segments of tarsus together.

Type locality: California. Lectotype in the collection of the Academy of Natural Sciences of Philadelphia. A specimen of *albicinctum* is in the United States National Museum, and the holotype of *dolichosoma* is in the Cockerell collection. Both of these appear to be typical *C. californicum*.

California: Tetley Park, San Bernardino Mountains, May 16 and 23, 1936, mostly on *Nemophila* (Timberlake & Michener); Banning, May 28, 1928 (E. C. Van Dyke); Riverside, May 15, 1933, on *Phacelia distans* (Timberlake); Redlands (no. 12) (F. R. Cole); Potwisha, Sequoia National Park, 2000 to 5000 feet elevation, May 15, 1929 (E. C. Van Dyke); mouth of Deep Creek, May 5, 1936, on *Eriodictyon trichocalyx* (Linsley & Timberlake); Marsh Creek, Mount Diablo, April 26, 1937, on *Phacelia* (G. E. & R. M. Bohart & Michener); Antioch, April 18, 1936 (G. E. Bohart); Swartout Valley, June 3, 1928, on *Phacelia davidsonii* (Timberlake).

Chelostomaphaceliæ Michener, n. sp.

This is a small black species. Length about 5 mm.

Male: Pubescence sparse, dull white, most abundant on cheeks and face and forming narrow broken abdominal bands; body finely and rather evenly punctate, rather dull; first segment of labial palpus about one-fourth as long as second, varying somewhat in the paratypes; maxillary palpi short, four-segmented; first segment short and globular, second longest, third shorter, fourth still shorter, only a little longer than first, nearly as long as third in some paratypes; mouth-parts very long, glossa nearly twice as long as facial line; horizontal area of propodeum finely rugose.

shorter than metanotum; punctures of scutum separated by less than their diameters and a little coarser than those of vertex. Wings large, dusky, veins and stigma black; second abscissa of cubital vein shorter than fourth. Abdomen slightly more finely punctate than head or thorax; seventh tergite ending in three long processes, all in the same plane, median longest, laterals slightly curved inward; second sternite with a transverse raised area; apices of abdominal segments narrowly brownish.

Female: Similar to male. Face a little broader, slightly longer than broad; eyes narrower; clypeus not very closely punctate, its anterior margin with a pair of sublateral tubercles between which the margin is straight; hind metatarsus very slightly shorter than remaining segments of tarsus; abdominal hair bands usually complete; scopa white.

Holotype male (Calif. Acad. Sci., Ent. No. 4491), allotype female (Calif. Acad. Sci., Ent. No. 4492) and six paratypes from Altadena, California, May 11, 1935, on *Phacelia tanacetifolia*.

Additional paratypes are from the following localities in California: Altadena, June 11, 1933, April 19, 1935, May 19, 1935, June 1, 1935, and May 2, 1936, all on *Phacelia*; one from San Gabriel Canyon, Los Angeles County, June 25, 1933, on *Lotus*; three from Sespe Canyon, Ventura County, April 22, 1934, on *Phacelia*; two from Los Angeles, June 16, 1934, on *Phacelia ramosissima* (all Michener collector); six from Rincon Creek, near Carpinteria, July 16, 1928 (E. C. Van Dyke); five from Idyllwild, San Jacinto Mountains, June 23, 1928 (E. C. Van Dyke); two from Fillmore, June 27, 1937 (B. E. White); thirteen from Riverside, April 20, 1926, April 26 and May 4, 1927, May 12 and June 4, 1930, April 8, 1932, May 14, 1936, on *Phacelia ramosissima* and *P. distans* (Timberlake); sixteen from Puente Hills, Los Angeles County, May 9 and 10, 1926, on *Phacelia distans* (Timberlake). Paratypes will be found in the collections of the California Academy of Sciences, the United States National Museum, Prof. T. D. A. Cockerell, Mr. P. H. Timberlake, Mr. E. G. Linsley, Mr. G. E. & Mr. R. M. Bohart, Mr. B. E. White and the author.

Additional locality records are as follows. California: Mariposa County, July 2, 1933 (G. E. & R. M. Bohart); Arroyo Seco, San Gabriel Mountains, July 6, 1922 (J. C. Bridwell, U. S. N. M.); California Hot Springs, Tulare County (E. R. Leach); Idyllwild, July 3, 1930, on *Erigeron foliosus* var. *stenophyllus*; Tetley Park, San Bernardino Mountains, May 13, 1934, on *Potentilla*; Mountain Home Creek, San Bernardino Mountains, June 17, 1934, July 4, 1935, on *Erigeron* and *Phacelia ramosissima*; Swartout Valley, June 3, 1928, on *Phacelia californica*; Big Pines Camp, San Gabriel Mountains, July 11 to 13, 1927, on *Phacelia ramosissima* and *P.*

californica; Coffee Camp, Tulare County, June 8, 1925 on *Phacelia*; General Grant National Park, June 27, 1929, on *Phacelia*; Berkeley Hills, June 4 and 16, 1933, on *Phacelia*; Green Valley, Solano County, June 9, 1933, on *Phacelia* (all Timberlake); Cobb Mountain, Lake County, May 7, 1936 (R. M. Bohart); Marsh Creek, Mount Diablo, May 12, 1937, on *Phacelia* (G. E. & R. M. Bohart).

Oregon: Wildhorse Canyon, Andrews, 4270 feet elevation, July 5, 1927 (H. A. Scullen).

Washington: Walla Walla, May 30, 1937 (G. E. & R. M. Bohart).

Specimens from the last two California localities average a little more finely punctate than most specimens. On account of the elongated mouth-parts and four-segmented maxillary palpi, this species might seem to represent a genus or subgenus distinct from *Chelostoma*. However, it appears to be so closely related to *C. bernardinum*, a species with normal mouth-parts, that a name is not warranted at present. The genitalia differ from those of *C. minutum* primarily in the broader, more rounded apices of the parameres. The female of *C. phaceliæ* is distinguished from *C. bernardinum* and *C. minutum* by the unusual mouth-parts, and the straight margin of clypeus between the tubercles. The male can be recognized by the three teeth of the seventh tergite, which are in the same plane. In many specimens the median tooth is more elongate and slender than in the individual figured, while in others it is slightly shorter.

Chelostoma bernardinum Michener, n. sp.

This is a small black species with the form similar to that of *C. phaceliæ*. Length about 5 mm. or a little less.

Female: Finely punctate, slightly shiny; facial line about as long as transfacial; clypeus closely punctate, anterior edge with distinct tubercle on each side, between which the margin is minutely crenulate; second segment of labial palpus nearly three times as long as first; maxillary palpi three-segmented, first segment short and globular, second longer and third a little longer than second; glossa a little longer than facial line; flagellum with under side faintly dull reddish; horizontal area of propodeum finely rugose, shorter than metanotum; punctures of scutum separated by less than their diameters and slightly finer than *C. phaceliæ*, very slightly coarser than those of vertex; punctures of scutellum a little finer and closer than those of scutum; tegulæ piceous; wings dusky, veins and stigma black; hind metatarsus very slightly longer than remaining segments of tarsus together;

abdomen slightly more finely punctate than head and thorax; apices of abdominal tergites narrowly brown; pubescence sparse, dull white, forming very narrow, weak abdominal bands on tergites; scopa white.

Male: Similar to female but more shiny and more finely punctate; scutum with punctures fine and separated by more than their diameters; seventh tergite with three long teeth, median largest, laterals slightly curved inward; median tooth directed slightly more ventrally than others so that the teeth are not on the same plane; second sternite with a transverse elevation; teeth of seventh tergite suffused with brown; margins of tergites, especially laterally, rather broadly brown; abdominal hair bands absent.

Holotype female (Calif. Acad. Sci., Ent. No. 4493), allotype male (collection of author), and six female paratypes: Tetley Park, San Bernardino Mountains, California, May 16, 1936, on *Nemophila* (Michener); six paratypes, same locality, May 16 and 23, 1936, and May 15, 1937, on *Nemophila integrifolia* and *Phacelia davidsonii* (Timberlake); two paratypes, same locality (labeled Crestline), May 13, 1934, on *Nemophila intergrifolia* (Timberlake). Paratypes are in the collection of Mr. P. H. Timberlake and the author.

This species is perhaps most nearly related to *C. phaceliæ*, from which it differs by the finer punctation, shorter mouthparts, three-segmented maxillary palpi, and the more ventrally directed median tooth of the seventh tergite of the male. One specimen is abnormal, having the median ocellus reduced to a slender line, somewhat widened at one end, and with a small pit in the broad portion.

CHELOSTOMA MINUTUM Crawford

This is a small, very slender, black species; length 4 to 5 mm.

Male: Second segment of labial palpus from two and one-half to nearly five times as long as first (according to subspecies); maxillary palpi three-segmented, first segment shortest, second somewhat longer, and third nearly or quite as long as first two together; glossa about one and one-half times as long as facial line; horizontal area of propodeum longer than metanotum, and very finely longitudinally rugose; punctures of abdomen finer than those of thorax; seventh tergite armed with four long processes, median ones longer and broader than laterals; parameres pointed at apices; process of coxopodites practically straight; second sternite with transverse elevation; abdominal hair bands absent.

Female: Similar to male; facial line longer than transfacial; clypeus not closely punctured, its margin straight between the two tubercles; hind metatarsus shorter than remaining tarsal segments together.

While not very much shorter than *C. phaceliæ*, this species is nevertheless considerably more slender. The female differs from *C. phaceliæ* by the smaller size, finer punctation, longer face, absence of abdominal bands, shorter mouth-parts, and three-segmented maxillary palpi. The male is distinguished by the same characters, in addition to the quadridentate seventh tergite. The male of *C. minutum* is here described for the first time.

Chelostoma minutum may be separated into several subspecies, as indicated below:

SUBSPECIES OF CHELOSTOMA MINUTUM					
		<u>cockerelli</u>	<u>minutum</u>	<u>marginatum</u>	<u>incisulum</u>
Margins of abdominal tergites		nearly black	nearly black	broadly brownish	broadly brownish
Length		about 5 mm.	about 5 mm.	usually just over 4 mm.	about 5 mm.
Median notch of seventh tergite		deeper than length of lateral process	deeper than length of lateral process	usually nearly as deep as length of lateral process	half as deep as length of lateral process
Length of 1st. segment labial palpus	av.	10.8	10.2	8.8	9.7
	max.	14	12	10	11
	min.	9	9	8	8
Length of 2nd. segment labial palpus	av.	43.7	30.0	29.2	27.0
	max.	61	37	30	28
	min.	37	27	27	25
Ratio of 2nd. to 1st.	av.	4.2	3.3	3.2	2.8
	max.	4.9	3.6	3.7	3.1
	min.	3.6	2.9	2.8	2.5
Flower preference		<u>Eriodictyon</u>	<u>Phacelia</u>	<u>Phacelia</u>	<u>Phacelia</u>
Distribution		Deserts and desert sides of mountains of Calif.	Sierra Nevada and mountains of southern Calif.	Lowlands of southern Calif.	Mt. Diablo, Calif.

The table above summarizes the subspecies of *C. minutum*. Measurements of the segments of the labial palpi were made with an eye piece micrometer, and the figures are merely relative. In order that the significance of these numbers may be judged, it should be stated that the palpal segments of fifteen specimens of typical *minutum*, fifteen of *cockerelli*, eight of *marginatum*, and three of *incisulum* were measured.

CHELOSTOMA MINUTUM MINUTUM Crawford

minuta Crawford, 1916, Ins. Insc. Mens., 4:102 ♀

minutum Cockerell, 1935, Pan-Pac. Ent., 11:52

Second segment of labial palpus averaging 3.3 times as long as first; posterior margins of tergites narrowly, obscurely brownish; emargination between median processes of seventh tergite of male deeper than length of lateral processes.

Type locality: Tuolumne Meadows, California. Type in United States National Museum.

California: Swartout Valley, June 3, 1928, on *Phacelia davidsonii*; Big Pines Camp, San Gabriel Mountains, July 13, 1927 and July 2, 1934, on *Phacelia californica*; Tetley Park, May 15, 1937, on *Phacelia davidsonii*, and May 16 1936, on *Nemophila integrifolia*; Ledge Trail, one-fourth way up, Yosemite, June 25, 1926, on *Draperia*; Pohona Trail, above Yosemite, June 16, 1926, on *Phacelia* (all Timberlake); Tallac, Lake Tahoe, July 17, 1915 (E. P. Van Duzee).

The following specimens provisionally placed in *minutum*, may be referred to other subspecies when more specimens are known from these localities:

California: Modoc National Forest, June 16, 1933, collected in flight (K. A. Salman); Summit Lake, Mt. Lassen, 6700 feet elevation, July 21 to 22, 1937 (F. X. Williams); Ridge Route, Los Angeles County, June 13, 1936 (H. A. Scullen). *Oregon*: Pamela Lake, Mt. Jefferson, 3000 feet, July 27, 1907 (J. C. Bridwell, U.S.N.M.). *Washington*: Spokane, July 2, 1917 (M. C. Dyar, U.S.N.M.)

Chelostoma minutum cockerelli Michener, n. subsp.

Second segment of labial palpus about four times as long as first; posterior margin of tergites narrowly, obscurely brownish; emargination between median processes of seventh tergite of male deeper than length of lateral processes.

Holotype male (Calif. Acad. Sci., Ent. No. 4494), allotype female (Calif. Acad. Sci., Ent. No. 4495), and thirteen paratypes: Andreas Canyon, near Palm Springs, California, on *Eriodictyon trichocalix (crassifolium)*, April 10, 1936 (Michener), and thirteen paratypes with same data, April 11 (Timberlake). Paratypes in collections of Prof. T. D. A. Cockerell, Mr. P. H. Timberlake, E. G. Linsley, G. E. and R. M. Bohart, and the author.

Additional localities for *cockerelli* are: California, mouth of Deep Creek, May 5, 1926, on *Eriodictyon trichocalyx*; Lone Pine Canyon, Inyo County, July 4, 1933, on *Eriodictyon trichocalyx* (all Timberlake); Palmdale, April 11, 1936 (G. E. & R. M. Bohart); Lancaster, April 10, 1936 (G. E. & R. M. Bohart).

This form differs from typical *C. minutum* primarily in the longer second segment of the labial palpus and the longer glossa. This is the desert and semidesert form of the complex. It seems to prefer the flowers of *Eriodictyon*, while other subspecies visit chiefly *Phacelia*. Named after Prof. T. D. A. Cockerell, with whom I collected at the type locality.

***Chelostoma minutum marginatum* Michener, n. subsp.**

Second segment of labial palpus about three times as long as first; posterior margins of tergites rather broadly brownish; emargination between median processes of seventh tergite of male nearly as deep as length of lateral processes.

Holotype male, allotype female, and seven paratypes: Puente Hills, Los Angeles County, California, on *Phacelia distans*, April 12, 1925, March 14 and 21 and May 9, 1926 (Timberlake). Paratypes: three from Eagle Rock Hills, Los Angeles County, on *Rhamnus crocea*, April 14, 1933 (Michener); five from Eagle Rock, on *Salvia mellifera*, April 7, 1936 (Michener). The holotype and allotype will be returned to the collection of Mr. P. H. Timberlake at Riverside, California. Paratypes are in the collections of the California Academy of Sciences, Mr. Timberlake, and the author.

Additional specimens of *marginatum* are from the following localities in California: Riverside, on *Phacelia distans*, March 21, 1926 (Timberlake); the Gavilan, on *Rhus trilobata*, April 18, 1937, and March 19, 1936 (Timberlake); Altadena, on *Eriodictyon crassifolium*, May 2, 1936 (Michener). Specimens from the Gavilan are larger and blacker than the more typical specimens of the subspecies.

This form differs from typical *minutum* and from *cockerelli* in the brownish margins of the tergites. The average length of the individuals of a series of *marginatum* is less than that of any other subspecies.

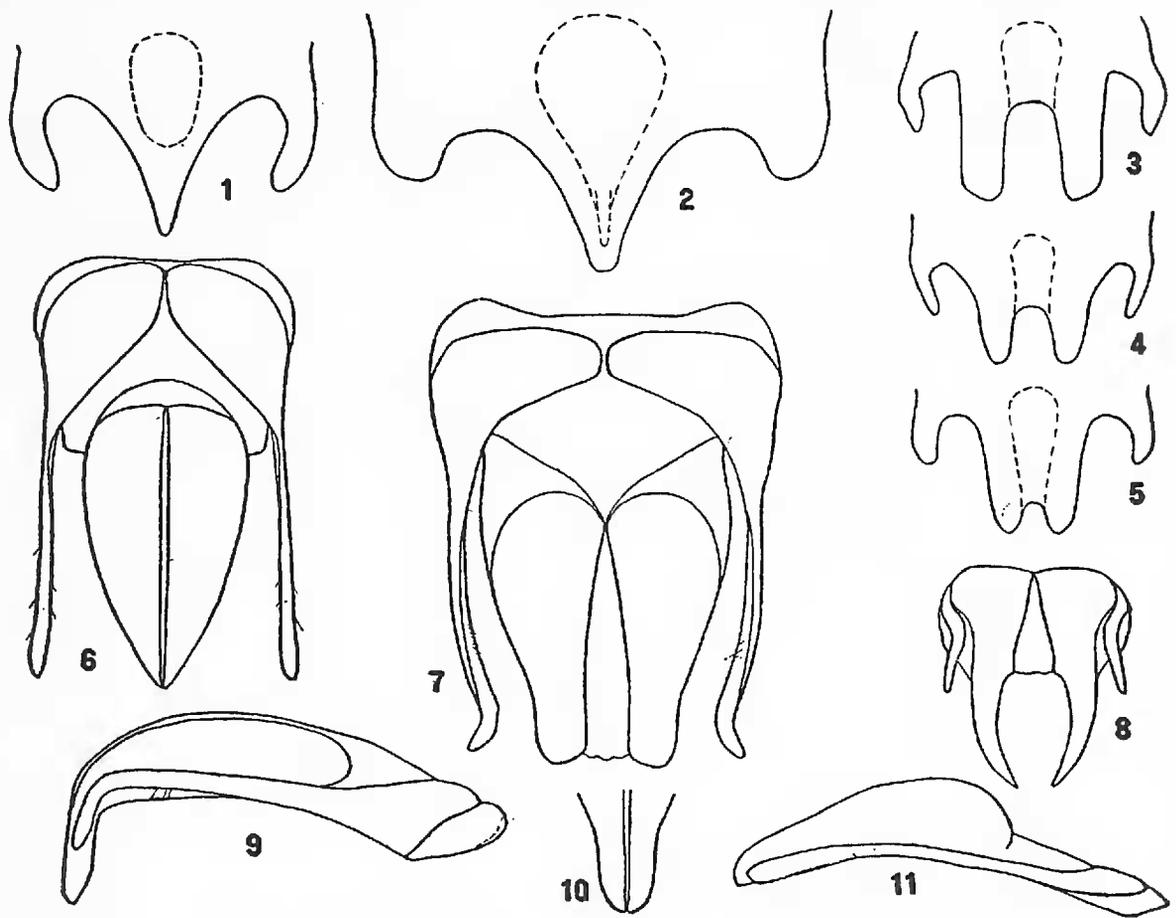
***Chelostoma minutum incisulum* Michener, n. subsp.**

Second segment of labial palpus about three times as long as first; posterior margins of tergites rather broadly brownish;

emargination between median processes of seventh tergite of male about half as deep as length of lateral processes.

Holotype male and two male paratypes: Marsh Creek, Mount Diablo, California, April 26, 1937, on *Phacelia* (Michener). Another male paratype bears the same data but was collected by G. E. and R. M. Bohart. Two females collected at the same time are apparently indistinguishable from *marginatum* except by the slightly larger size.

C. m. incisulum differs from *marginatum* in the relatively shallow notch between the median processes of the seventh tergite of the male. The size is about as large as in typical *minutum*.



1. Seventh tergite of *Chelostoma phaceliæ* Michener, male; 2 Same of *Chelostoma californicum* Cresson, male; 3. Same of *Chelostoma minutum cockerelli* Michener, male; 4. Same of *Chelostoma minutum marginatum* Michener, male; 5. Same of *Chelostoma minutum incisulum* Michener, male; 6. Dorsal view of male genitalia of *Chelostoma minutum* Crawford; 7. Same of *Chelostoma californicum* Cresson; 8. Posterior view of male genitalia of *Chelostoma californicum* Cresson; 9. Lateral view of male genitalia of *Chelostoma californicum* Cresson; 10. Dorsal view of apices of parameres of *Chelostoma phaceliæ* Michener; 11. Lateral view of male genitalia of *Chelostoma minutum* Michener.

(Figures 1-5 are drawn to the same scale.)